Zeitschrift für Physik

Unter Mitwirkung der Deutschen Physikalischen Gesellschaft
herausgegeben von

E. Fünfer O. Haxel G. Leibfried H. A. Weidenmüller

Band 269 · 1974

Springer-Verlag Berlin Heidelberg New York

Begründet 1920. Herausgegeben unter Mitwirkung der Deutschen Physikalischen Gesellschaft von *K. Scheel* und *H. Geiger*, Bd. 124–141 (1947–1955) von *M. v. Laue* und *R. W. Pohl*, Band 142–203 (1955–1967) von *O. Haxel* und *H. Jensen*, Bd. 204–258 (1967–1973) von *E. Fünfer, O. Haxel, H. Jensen* und *G. Leibfried*, ab Band 259 von *E. Fünfer, O. Haxel, G. Leibfried* und *H. A. Weidenmüller*. Band 129–175 unter Mitwirkung des Verbandes Deutscher Physikalischer Gesellschaften herausgegeben; ab Band 176 unter Mitwirkung der Deutschen Physikalischen Gesellschaft. Band 1–4 (1921): Braunschweig, Fr. Vieweg & Sohn. Ab Band 5: Berlin, Springer.

Founded in 1920. Edited with the collaboration of the Deutsche Physikalische Gesellschaft by *K. Scheel* and *H. Geiger;* Vols 124–141 (1947–1955) by *M. v. Laue* and *R. W. Pohl;* Vols 142–203 (1955–1967) by *O. Haxel* and *H. Jensen;* Vols 204–258 (1967–1973) by *E. Fünfer, O. Haxel, H. Jensen,* and *G. Leibfried,* from Vol. 259 by *E. Fünfer, O. Haxel, G. Leibfried,* and *H. A. Weidenmüller*. Vols 129–175 were produced with the collaboration of the Verband Deutscher Physikalischer Gesellschaften; from Vol. 176, the Deutsche Physikalische Gesellschaft. Published: Vols 1–4 (1921) Braunschweig, Fr. Vieweg & Sohn; Vol. 5 onwards, Berlin, Springer.

*

Alle Rechte, einschließlich das der Übersetzung in fremde Sprachen und das der fotomechanischen Wiedergabe oder einer sonstigen Vervielfältigung, auch in Mikroform, vorbehalten. Jedoch wird gewerblichen Unternehmen für den innerbetrieblichen Gebrauch nach Maßgabe des zwischen dem Börsenverein des Deutschen Buchhandels e.V. und dem Bundesverband der Deutschen Industrie abgeschlossenen Rahmenabkommens die Anfertigung einer fotomechanischen Vervielfältigung gestattet. Wenn für diese Zeitschrift kein Pauschalabkommen mit dem Verlag vereinbart worden ist, ist eine Wertmarke im Betrage von DM 0,40 pro Seite zu verwenden. *Der Verlag läßt diese Beträge den Autorenverbänden zufließen.*

Die Wiedergabe von Gebrauchsnamen, Handelsnamen, Warenbezeichnungen usw. in dieser Zeitschrift berechtigt auch ohne besondere Kennzeichnung nicht zu der Annahme, daß solche Namen im Sinne der Warenzeichen- und Markenschutz-Gesetzgebung als frei zu betrachten wären und daher von jedermann benutzt werden dürften.

The exclusive copyright for all languages and countries, including the right for photomechanical and any other reproductions, also in microform, is transferred to the publisher.

The use of registered names, trademarks, etc. in this publication does not imply, even in the absence of a specific statement, that such names are exempt from the relevant protective laws and regulations and therefore free for general use.

Springer-Verlag · Berlin · Heidelberg · New York

Printed in Germany – © by Springer-Verlag Berlin · Heidelberg 1974

Printers: Universitätsdruckerei H. Stürtz AG, Würzburg

Contents

Ackermann, H., s. Stöckmann, H.-J., *et al.* . . . 47

Antanasijević, R., Todorović, Ž., Jurić, M.: The Cross-Sections for the Binary and Ternary Fission of Platinum Induced by 14, 18 and 23 GeV Protons 385

Arneodo, A., Rocca, F.: Quantum Effects in Photodetection Processes 205

Aspelund, O., s. Djaloeis, A., *et al.* 133

Atanassov, V., Zhelyazkov, I., Shivarova, A.: Low-Frequency Surface Waves on a Semi-Bounded Non-Isothermal Plasma 215

Bar-Sagi, J.: Low Lying Excitations in a Pair-Potential Well 7

Bartl, A., Wittmann, K.: A Modified Born Term Model for π^+ Δ Electroproduction 399

Becker, G.: Axial Contraction in Toroidal Pinches with Non-Circular Plasma Cross-Sections . 35

Becker, G., Wunderlich, R.: Neutron Flux Distribution on the Wall of Toroidal Controlled Thermonuclear Reactor Devices with Elongated Cross Section 41

Bergstedt, K., Hülsmann, H.G.: Experimentelle Untersuchung von Emissionseigenschaften eines koaxialen Stickstofflasers 195

Berinde, A., Dumitru, R.O., Grecescu, M., Iordăchescu, A., Neamu, I., Pascovici, G., Ploştinaru, D., Teodorescu, C.M.: Excited States in ^{91}Nb Populated in the ^{89}Y$(\alpha, 2n\gamma)$ Reaction 117

Bestgen, W.: Fluctuation Theory of the One-Dimensional "Mixed" State in First Kind Superconductors 73

Biem, W., s. Bunde, A. 65

Blok, J., s. Goverse, S.C., *et al.* 111

Brandt, U.: Thermodynamic Properties of the One-Dimensional Hubbard Model 221

Braun-Munzinger, P., s. Harney, H.L., *et al.* . . 339

Büttgenbach, S., Herschel, M., Meisel, G., Schrödl, E., Witte, W., Childs, W.J.: Hyperfine Structure Measurements in the Ground States $^5F_5$, $^5F_4$, $^5F_3$ and $^5F_2$ of ^{99}Ru and ^{101}Ru with the Atomic Beam Magnetic Resonance Method 189

Bunde, A., Biem, W.: Spin Waves in the Isotropic Heisenberg Antiferromagnet Above the Néel Point 65

Burkhardt, T.W.: Internal Stresses in the $\alpha-\alpha'$ Phase Transition of Coherent Metal-Hydrogen Systems 237

Childs, W.J., s. Büttgenbach, S., *et al.* 189

Claeson, T., s. Granqvist, C.G. 23

Coker, W.R., s. Hoffmann, G.W. 307

Cornell, J.C., McMurray, W.R.: Spins of Levels in ^{41}Ca from $(d, p\gamma)$ Angular Correlations . . . 315

Djaloeis, A., Ingham, D., Kelleter, H., Aspelund, O., Mayer-Böricke, C.: Study of the ^{24}Mg$(d, ^6$Li$)^{20}$Ne Reaction at 80 MeV 133

Dougan, P., Forkman, B., Stiefler, W., Matthews, J.L.: An Analysis of Some Recent Results on Photo-Protons from High-Energy Bremsstrahlung 105

Dougan, P., Stiefler, W.: Yield Curves for Photo-Proton Emission from Carbon and Beryllium 97

Drachenfels, W. v., Koch, U.T., Lepper, R.D., Müller, T.M., Paul, W.: Intense Pulses of Polarized Electrons Produced by Fano Effect 387

Dubbers, D., s. Stöckmann, H.-J., *et al.* 47

Dumitru, R.O., s. Berinde, A., *et al.* 117

Eijk, W. van der, s. Hansen, H.H., *et al.* 155

Elliott, D.O., Hopkins, F.F., Phillips, G.W., Richard, P.: Low Lying Levels in ^{124}Sb 89

Faessler, A., s. Krewald, S., *et al.* 125

Falke, H.P., Jablonski, H.P., Wassermann, E.F.: On the Kondo Resistance Anomaly in Dilute Zn – Mn Alloys 285

Fechner, J.B., s. Forker, M., *et al.* 279

Fischer, W., Hühnermann, H., Mandrek, K.: Isotope Shift Measurements in the Atomic Spectrum of Lanthanum (La I) 245

Ford, J.L.C., Jr., Gomez del Campo, J., Robinson, R.L., Stelson, P.H., Thornton, S.T.: Measurements and Hauser-Feshbach Analysis of the ^{10}B$(^{16}$O, ^{6}Li$)^{20}$Ne Reaction 147

Forker, M., Fechner, J.B., Haverkamp, H.: Study of the Electric Quadrupole Interaction at Ta Impurities in Rare Earth Metal Hosts . . . 279

Forkman, B., s. Dougan, P., *et al.* 105

Forsblom, I., s. Viitasalo, M. 173

Froitzheim, H., Ibach, H.: Interband Transitions in ZnO Observed in Low Energy Electron Spectroscopy 17

Gelbke, C.K., s. Harney, H.L., *et al.* 339

Gomez del Campo, J., s. Ford, J.L.C., Jr., *et al.* . 147
Goverse, S.C., Kuijper, J., Blok, J.: Electron Capture Ratios in ^{206}Bi 111
Granqvist, C.G., Claeson, T.: Localized Phonons and Lattice Order Transformations in Thallium Based Alloys by Superconductive Tunneling 23
Graubner, F., Hermann, G., Scharmann, A.: Effect of Collisions on the Mode Crossing Signals of a He/Ne-Laser 79
Grecescu, M., s. Berinde, A., *et al.* 117
Grupp, M., s. Stöckmann, H.-J., *et al.* 47
Hansen, H.H., Roost, E. de, Eijk, W. van der, Vaninbroukx, R.: The Decay of ^{115m}In 155
Harney, H.L., Braun-Munzinger, P., Gelbke, C.K.: On the Semiclassical Interpretation of Heavy Ion Reactions 339
Hasegawa, A., Kübler, J.: Energy Bands and Fermi Surface of the Intermetallic Compound YZn 31
Hauser, U., Neuwirth, W., Pietsch, W., Richter, K.: On the Determination of Collision Cross Sections by Nuclear Doppler Shift . . . 181
Haverkamp, H., s. Forker, M., *et al.* 279
Heitjans, P., s. Stöckmann, H.-J., *et al.* 47
Hermann, G., s. Graubner, F., *et al.* 79
Hernández, E.S., s. Peltier, S.M., *et al.* 347
Herschel, M., s. Büttgenbach, S., *et al.* 189
Herzog, P., Klemme, B., Schäfer, G.: Static Electric Quadrupole Interaction of Ce and Pb Ions in Lead Titanate 265
Hoffmann, G.W., Coker, W.R.: Microscopic Versus Macroscopic Descriptions of the (p, n) Charge-Exchange Reaction 307
Hofmann, A., s. Wühr, W., *et al.* 365
Hopkins, F.F., s. Elliott, D.O., *et al.* 89
Hühnermann, H., s. Fischer, W., *et al.* 245
Hülsmann, H.G., s. Bergstedt, K. 195
Ibach, H., s. Froitzheim, H. 17
Ingham, D., s. Djaloeis, A., *et al.* 133
Iordăchescu, A., s. Berinde, A., *et al.* 117
Jablonski, H.P., s. Falke, H.P., *et al.* 285
Jensen, K., Veje, E.: An Experimental Study of Optical Radiation from Sputtered Species . . 293
Jurić, M., s. Antanasijević, R., *et al.* 385
Kelleter, H., s. Djaloeis, A., *et al.* 133
Klemme, B., s. Herzog, P., *et al.* 265
Koch, U.T., s. Drachenfels, W. v., *et al.* 387
Korth, K.: Sonderstellung der Ca^{++}-Ionen beim Einbau 2wertiger Kationen in NaCl-Einkristalle 301
Korth, K.: Infrarot-Absorption an Einkristallspaltstücken durch dünne adsorbierte Talkum-Schichten 305
Kramer, L., Pesch, W.: Core Structure and Low-Energy Spectrum of Isolated Vortex Lines in Clean Superconductors at $T \ll T_c$ 59
Kramer, L., s. Pesch, W., *et al.* 253
Krewald, S., Schmid, K.W., Faessler, A.: The Influence of Correlations on the Odd-Mass Nuclei ^{21}Ne and ^{25}Mg 125
Krinn, H.: The Beta Decay of Pm^{146} with Microscopic Nuclear Wave Functions 373
Krüger, W., s. Rödelsperger, K., *et al.* 83
Kübler, J., s. Hasegawa, A. 31
Kuijper, J., s. Goverse, S.C., *et al.* 111
Kuiper, H.: The Crystal Magnetic Field in a Proton-Polarized Lanthanum Magnesium Nitrate Single Crystal 379
Lepper, R.D., s. Drachenfels, W. v., *et al.* 387
Link, R.: Magnetic Hyperfine Interaction in Muonic Indium, Osmium and Mercury . . . 163
Löbner, K.E.G., Mirza, J.A.: $E1$–$M2$–$E3$ Mixing of the 1241.7 keV Transition in ^{174}Yb . . . 407
Mackh, H., Mairle, G., Wagner, G.J.: Proton Shell Structure of Mass 28–32 Nuclei 353
Mairle, G., s. Mackh, H., *et al.* 353
Maletta, H., s. Shenoy, G.K. 241
Mandrek, K., s. Fischer, W., *et al.* 245
Matthews, J.L., s. Dougan, P., *et al.* 105
Mayer, H., Zembold, O., Steffen, H.: Zur Bestimmung der Frequenz von Plasmaschwingungen durch optische Messungen an dünnen Metallschichten: Transmissionsmessungen an Kaliumschichten bei den Temperaturen des flüssigen N_2 und He 229
Mayer-Böricke, C., s. Djaloeis, A., *et al.* 133
McMurray, W.R., s. Cornell, J.C. 315
Meisel, G., s. Büttgenbach, S., *et al.* 189
Mirza, J.A., s. Löbner, K.E.G. 407
Müller, T.M., s. Drachenfels, W. v., *et al.* 387
Narain, J.P., s. Uberoi, M.S. 1
Neamu, I., s. Berinde, A., *et al.* 117
Neuwirth, W., s. Hauser, U., *et al.* 181
Pascovici, G., s. Berinde, A., *et al.* 117
Paul, W., s. Drachenfels, W. v., *et al.* 387
Peltier, S.M., Plastino, A., Hernández, E.S.: Schematicity and Ground State Correlations in the Lead Isotopes 347
Pesch, W., Watts-Tobin, R., Kramer, L.: Transport Coefficients in the Mixed State of Dirty Superconductors 253
Pesch, W., s. Kramer, L. 59
Philipp, G., s. Wühr, W., *et al.* 365
Phillips, G.W., s. Elliott, D.O., *et al.* 89
Pietsch, W., s. Hauser, U., *et al.* 181
Plastino, A., s. Peltier, S.M., *et al.* 347

Ploştinaru, D., s. Berinde, A., *et al.* 117
Regenfus, G.: Die Rotation des Elektronenspins beim ebenen Tunnelprozeß mit überlagertem homogenem Magnetfeld 259
Richard, P., s. Elliott, D.O., *et al.* 89
Richter, K., s. Hauser, U., *et al.* 181
Ring, P., Schuck, P.: A Numerical Comparison of Three Different Approaches to the Weak or Intermediate Coupling Model for 2 Particle – 1 Hole States 323
Robinson, R.L., s. Ford, J.L.C., Jr., *et al.* 147
Rocca, F., s. Arneodo, A. 205
Rödelsperger, K., Krüger, W., Scharmann, A.: Angular Distribution of Copper Atoms Sputtered with Energetic Ions 83
Roost, E. de, s. Hansen, H.H., *et al.* 155
Schäfer, G., s. Herzog, P., *et al.* 265
Scharmann, A., s. Graubner, F., *et al.* 79
Scharmann, A., s. Rödelsperger, K., *et al.* . . . 83
Schmid, K.W., s. Krewald, S., *et al.* 125
Schmidt, G., Simons, L.M.: Investigation on the Parity Mixing of the 482 keV Transition in ^{181}Ta by Use of a Backscattering Polarimeter 421
Schrödl, E., s. Büttgenbach, S., *et al.* 189
Schuck, P., s. Ring, P. 323
Shenoy, G.K., Maletta, H.: ^{151}Eu Low Temperature Mössbauer Thermometer 241
Shivarova, A., s. Atanassov, V., *et al.* 215
Simons, L.M., s. Schmidt, G. 421
Steffen, H., s. Mayer, H., *et al.* 229
Stelson, P.H., s. Ford, J.L.C., Jr., *et al.* 147
Stiefler, W., s. Dougan, P., *et al.* 97, 105
Stöckmann, H.-J., Ackermann, H., Dubbers, D., Grupp, M., Heitjans, P.: Elektrische Quadrupolwechselwirkungen von ^{20}F im MgF_2-Einkristall 47
Szybisz, L.: The β-Moments for the Second-Forbidden β-Decay from ^{137}Cs, the CVC Theory, and the Residual Interactions . . . 139
Tausendfreund, W.: Der Zugang zur Stark-Leiter über die Boltzmann-Gleichung 11
Teodorescu, C.M., s. Berinde, A., *et al.* 117
Thornton, S.T., s. Ford, J.L.C., Jr., *et al.* 147
Todorović, Ž., s. Antanasijević, R., *et al.* 385
Uberoi, M.S., Narain, J.P.: Generalized Heisenberg Theory of Turbulence 1
Vaninbroukx, R., s. Hansen, H.H., *et al.* 155
Veje, E., s. Jensen, K. 293
Viitasalo, M., Forsblom, I.: An Investigation of Excited States in ^{32}S by the $^{31}P(p,\gamma)^{32}S$ Reaction 173
Vitturi, A., Zardi, F.: On the Relation between Resonances and K-Matrix Poles 333
Wagner, G.J., s. Mackh, H., *et al.* 353
Wassermann, E.F., s. Falke, H.P., *et al.* 285
Watts-Tobin, R., s. Pesch, W., *et al.* 253
Weßjohann, H.G.: Elektromagnetische Anregungen einer optisch einachsigen dielektrischen Schicht durch relativistische Elektronen . . 269
Witte, W., s. Büttgenbach, S., *et al.* 189
Wittmann, K., s. Bartl, A. 399
Wühr, W., Hofmann, A., Philipp, G.: Optical Model and DWBA Analysis of the α-Particle Scattering for the Nuclei ^{26}Mg and ^{28,30}Si Including Hauser-Feshbach Contributions . 365
Wunderlich, R., s. Becker, G. 41
Wunner, G.: Die Klassifikation nach inneren Symmetrien beim quantenmechanischen Mehrkörperproblem. II. n-Teilchensysteme mit harmonischer Wechselwirkung 411
Zardi, F., s. Vitturi, A. 333
Zembold, O., s. Mayer, H., *et al.* 229
Zhelyazkov, I., s. Atanassov, V., *et al.* 215

Indexed in Current Contents

Forthcoming Papers

S. Hofmann, Institut für Kernphysik der Technischen Hochschule Darmstadt:
Kernspektroskopische Untersuchungen zu den Termschemata der Kerne ^{56}Fe und ^{56}Co (Nuclear Spectroscopy Investigations Related to the Level Diagrams of the Nuclei ^{56}Fe and ^{56}Co)

Gamma-gamma directional correlations have been investigated for several cascades in ^{56}Fe formed in the decay of ^{56}Mn or ^{56}Co. A combination of NaI(Tl) and Ge(Li) detectors was used for the experiments. It was established that a level at 3601 keV is populated in the decay of ^{56}Co. Spins given in the paranthesis were assigned to levels at the following energies: 2658(2), 2960(2), 3123(4), 3370(2), 3445(3), 3601(2), 3856(3), 4049(3), 4100(4), 4120(3), 4298(4), 4395(3) and 4459 keV (3, 4). Multipole mixing ratios were determined for γ transitions of the following energies: 978, 1038, 1175, 1360, 1772, 1811, 1964, 2015, 2035, 2113, 2213, 2523, 2599, 3010, 3202, 3254, 3273, 3451 and 3548 keV. The γ-rays from the decay of ^{56}Co of energies 674.6 and 2657.7 keV have been observed for the first time, and the presence of several other weak γ-rays in the ^{56}Fe decay has been confirmed. Nine angular correlations in the decay of ^{56}Ni have been investigated. The spin sequence 4, 3, 2, 0, 1 was unambiguously determined for the levels at 0, 158.2, 970.1, 1450.7 and 1720.0 keV. The multipolarity of the γ-rays of energies 158.2, 749.9 and 811.9 keV was determined as almost pure $M1$. The results are discussed within the framework of recent shell model calculations.

W. Fischer, H. Hübnermann, G. Krömer, and H.J. Schäfer, Fachbereich Physik der Philipps-Universität Marburg:
Isotope Shifts in the Atomic Spectrum of Xenon and Nuclear Deformation Effects

Optical isotope shifts of four lines in the atomic spectrum of xenon have been measured using enriched samples of all stable xenon isotopes. The spectrograms were recorded with the aid of a pressure-scanned Fabry-Pérot interferometer and analysed by digital data techniques. The measured isotope shifts are shown to be self-consistent by means of a King plot. An estimate of the specific mass effect is given and the changes $\delta\langle r^2\rangle$ of the mean square radius of the nuclear charge distribution are extracted from the measured shifts. These changes $\delta\langle r^2\rangle$ are discussed in terms of the nuclear deformation parameter β^2. The results for the deformation of the stable even xenon isotopes are shown to be in good agreement with the systematic of deformation found for the neighbouring elements from Coulomb excitation experiments.

E. Barnard, N. Coetzee, J.A.M. de Villiers, D. Reitmann, and P. van der Merwe, Atomic Energy Board, Pelindaba, Transvaal, Republic of South Africa:
Fast Neutron Scattering from Cesium

A study was made of the (n, n), (n, n') and $(n, n'\gamma)$ reactions which occur when a cesium scattering sample is exposed to mono-energetic neutrons of energies ranging from 120 to 1910 keV. Total cross-sections, elastic scattering angular distributions and excitation functions for inelastic scattering were measured with a neutron time-of-flight spectrometer. Results are compared with statistical theory. A 40 cc Ge(Li) detector was used in the time gated mode to measure γ-rays from the $(n, n'\gamma)$ reaction. These data were used to refine and extend the energy level scheme derived from the neutron spectroscopy measurements and mainly confirm the results of recent, similar measurements.

U. Brandt and W. Groß, Universität Dortmund, Institut für Physik, Dortmund, Germany:
Magnetic Disorder in Itinerant Systems

We present an averaging procedure to study the behaviour of a magnetically disordered electron system. A model with stochastic localized magnetic fields at the atomic sites is introduced and a CPA-like method, which has regard to the vector character of the stochastic fields, is employed. The resulting new effects for the density of states are demonstrated for two examples.

D. Korn, H. Pfeifle and G. Zibold, Fachbereich Physik der Universität Konstanz:
Electrical Resistivity of Amorphous Alloys

Amorphous alloys of Ga, Sn, Pb and Bi with Cu, Ag and Au are produced by evaporation on a cold substrate. The residual resistivity, the temperature dependence of the resistivity, the transition temperature of superconductivity and the temperature of the amorphous-crystalline transformation are measured. We observe e.g. that the residual resistivity increases with the noble metal concentration, and that the temperature coefficient of the resistivity of the Au alloys is always negative. In these two respects amorphous alloys differ in behaviour from the corresponding liquid alloys. These observations can be correlated with the atomic energy levels of the free atoms.

P. Drehmann, Institut für Strahlenphysik der Universität Stuttgart:
Beta-Gamma-Winkelkorrelation bei ^{146}Pm (β-γ Directional Correlation of ^{146}Pm)

A measurement of the β-γ directional correlation $\omega(W, \Theta)$ of the $3^-(\beta)2^+(\gamma)0^+$ decay of ^{146}Pm is described. Spin and parity of the ground state of ^{146}Pm are found to be 3^-. A set of matrix elements $Y=0.94$; $x=0.20$; $u=0.20$; $z=1$, which is chosen to fit the experimental results for $\omega(W, \Theta)$ and which is in agreement with the CVC theory, indicates a K-selection rule effect for the 0.795 MeV beta transition of ^{146}Pm.

R. Laurenz, E. Klein, and W.D. Brewer, Institut für Atom- und Festkörperphysik, Freie Universität Berlin, Berlin, W.-Germany:
NMR Detected by Mössbauer-Effect, Applied to the System ^{57}CoFe

The detection of NMR in oriented nuclei via the Mössbauer effect in the daughter state is described and its specific advantages and drawbacks compared to other methods. As an example, the NMR of ^{57}Co in Fe was observed in external fields of 0–8 kG. The zero field frequency yields a magnetic moment $\mu_{57}/\mu_n = 4.708 \pm 0.012$. The different value found from the slope of the resonance frequency vs. external field is attributed to a Knight shift of $(+2.9 \pm 1.2)\%$.

J. Keinonen, A. Anttila, and M. Bister, Department of Physics, University of Helsinki, Helsinki, Finland:
On the Gamma Decay of Analogue Resonances in the ^{58}Fe(p, γ)^{59}Co Reaction

Resonances in the reaction ^{58}Fe(p, γ)^{59}Co have been studied in the analogue region $E_p = 2.20$–2.25 MeV. The γ-ray decays of fourteen resonances and the energies of nine bound states have been obtained using a 80 cm^3 Ge(Li)-detector. The Q-value was found to be 7359.7 ± 3.0 keV. One lifetime and six lifetime limits were determined from the Doppler-shift attenuation method for bound states.

Forthcoming Papers

K.L. Shukla, Department of Physics, University of Rajasthan, Jaipur, India:
Interaction of an Obliquely Incident Electromagnetic Wave with Collisional Plasma Half Space

Penetration and reflection of an electromagnetic wave incident obliquely on a semi-infinite collisional plasma is studied. The linearized Boltzmann equation is used for the perturbed plasma. Using Fourier transform technique, specular boundary condition and simple collisional model the solution of coupled Maxwell-Boltzmann equations is presented. The field solutions consist of both longitudinal and transverse parts into the plasma region. The reflection coefficient is also obtained.

M. Heuser and J. Hajdu, Institut für Theoretische Physik, Universität zu Köln, Köln, Germany:
On Diamagnetism and Non-Dissipative Transport

The states of free electrons in a magnetic field confined to a box of finite volume are determined and used to calculate the average magnetic moment and the non-dissipative electric and heat current in an unambiguous way. It is shown that for infinite volume the average magnetic moment coincides with the magnetization calculated by Landau. Similarly, for infinite volume, the non-dissipative transport coefficients coincide with those calculated by Zyryanov and Silin who use Landau's method and subtract the purely diamagnetic parts from the total currents. We think that our considerations give an answer to the often discussed question, why the Landau calculation of the magnetization and similar calculations of the non-dissipative transport coefficients are correct for a large system.

G. Sperlich, P.H. Zimmermann and G. Keller, Experimentalphysik II, Technische Hochschule Darmstadt, Germany:
Magnetic Susceptibility and Electron Spin Resonance of the Semiconducting Mixed Crystal V_2MoO_8 ($V_2O_4 \cdot MoO_3$)

The transition metal lattice sites of V_2MoO_8 are occupied by vanadium- and molybdenum ions in a disordered way. Our measurements of the magnetic susceptibility and the electric conductivity show that V_2MoO_8 is paramagnetic and semiconducting. The ESR investigations prove the existence of localized *d* electrons (Anderson localization). A hopping process of these *d* electrons in vanadium 3*d* orbitals leads to an ESR line narrowing. Above 50 K a line broadening occurs which is interpreted as a shortening of the effective lifetime of the localized *d* electrons.

A. Bunde, Institut für Theoretische Physik, Universität Gießen, Germany:
Correlation Functions of the Ising Model of Solid Ortho-Hydrogen in the Disordered Phase

In a generalized molecular field approximation the time independent correlation functions as well as the time dependent ones are calculated for the Ising model of $o-H_2$ in the orientationally disordered phase. In our treatment the correlations fulfill their characteristic sum rule automatically. The order parameter correlation shows the characteristic singularity at the stability limit for $k=0$. The time dependent correlations are calculated within the Glauber stochastic model and show critical behaviour at the stability limit.

Alfred Hüller, Department of Physics and Astronomy, University of Massachusetts, Amherst, Massachusetts:
Tricritical Points for Competing Interactions

Competing interactions, responsible for two differently ordered phases in the ammonium halides, also cause the coexistence of different short range correlations in the disordered state. Correlations of the nonordering density may be the reason for tricritical behavior or even a discontinuity of the transition. Molecular field theory neglects all correlations and thus is unable to provide an appropriate description of NH_4Cl under pressure and of NH_4Cl-NH_4Br mixtures. In this paper a phase diagram is obtained for the ammonium halides in first Bethe approximation from a simplified model Hamiltonian with competing interactions. A tricritical point is found for the order-disorder transition into the uniform or "ferromagnetic" phase as well as for the transition into the "antiferromagnetic" phase.

V. Wildpaner, Atominstitut der Österreichischen Hochschulen, Wien, Austria:
Monte Carlo Study of Small Magnetic Particles

In earlier computer simulation small magnetic particles with nearest neighbor Heisenberg interactions in zero magnetic field have been studied. We now continue these investigations including next nearest neighbor exchange and non zero magnetic fields *H*. The particles treated have spherical shape with a number of spins *N* in the range from 33 to 3071. It is shown that the spontaneous magnetization of the particles is rather different from the bulk magnetization. The magnetization process can be accounted for by the Néel theory, if the correct spontaneous magnetization of the particle is used. The distribution of local magnetizations (the magnetic "profile") was also obtained in various cases. It is shown that the magnetization of very small particles is much more depressed than predicted by the mean field approximation. We introduce an "effective magnetic radius" $\hat{R}$ accounting for the reduction of the local magnetization. This magnetic radius is important for the interpretation of experimental results. A distinct dependence of $\hat{R}$ on the magnetic field temperature and the fraction of next nearest neighbor exchange is found. Finally a brief comparison is made with the recent study of magnetic surface properties by Binder and Hohenberg.

M. Weithase and F. Noack, Physikalisches Institut der Universität Stuttgart, Germany:
Kernrelaxations-Untersuchung der Selbstdiffusion in festem Kupfer

We report on measurements of the ^{63}Cu nuclear spin relaxation time in the rotating frame, $T_{1\rho}$, in solid copper as a function of temperature and Larmor frequency, from which the temperature dependence of the self-diffusion coefficient was evaluated using Torrey's theory. Within the relatively small temperature range ($572\,^{\circ}C \leqq \vartheta \leqq 838\,^{\circ}C$) in which diffusion relaxation dominates, the temperature dependence of the diffusion coefficient is compatible with a simple Arrhenius law. However, in an evaluation including recent tracer results in an essentially larger temperature range ($353\,^{\circ}C \leqq \vartheta \leqq 1079\,^{\circ}C$) clear deviations from this standard interpretation were found, as implied by Seeger's divacancy formalism. From those deviations we have calculated a more reliable set of diffusion parameters than comparable data in the literature.

Forthcoming Papers

V. Buck, I. Physikalisches Institut der Universität Göttingen und SFB 126, Göttingen, Germany:
Zur Erzeugung amorpher Zinn-Schichten durch abschreckende Kondensation mit Fremdzusätzen

Thin films of Sn with additives are prepared by quench condensation. The annealing behaviour of the electrical resistivity and the transition to the superconducting state of these films are investigated in relation to the dependence of composition and film thickness. The data indicate, whether the films are in an amorphous state or not. It appears that the films become amorphous, if the addition has an atomic radius less than Sn and if the mean valence electron concentration is less than 3.7. With further reduction of the valence electron concentration the amorphous films become more stable and the temperature of transformation from the amorphous state to the crystalline state rises. The thickness dependence of the transformation temperature can be explained with a simple further assumption.

J. Petersen, I. Physikalisches Institut der Universität Göttingen und SFB 126, Göttingen, Germany:
Elektronische Wärmeleitung von supraleitenden Blei-Mangan-Legierungen

Measurements of the electronic thermal conductivity of superconducting lead and lead-manganese-alloys are reported. The samples are quench condensed-films. The thermal conductance of lead films is in good agreement with the BRT-theory. In spite of lead-manganese perhaps being a Kondo-system the thermal conductivity of this alloy is reasonably well described by the Ambegaokar-Griffin theory. Our measurements do not agree with those on indium-manganese alloys reported by other Authors.

K. Farzine and H. von Buttlar, Institut für Experimentalphysik der Ruhr-Universität Bochum, Germany:
Levels of ^{195}Au from the Decays of ^{195g}Hg and ^{195m}Hg

The levels of ^{195}Au were analyzed by observing γ-singles and $\gamma\gamma$-coincidences following the ^{195}Hg decay. Nine new lines are found which require two new levels at 778 and 946 keV. An interpretation of the level scheme is given on the basis of the de Shalit core-excitation model. A qualitative understanding of all levels up to 1 MeV excitation energy is obtained.

R. Hippler and K.-H. Schartner, I. Physikalisches Institut der Universität Gießen, Germany:
Absolute Cross Sections for the Excitation of the $1s_2$- and $1s_4$-Levels of Neon and Argon by Proton Impact (100 keV to 1 150 keV)

The excitation of the $1s_2$ and $1s_4$ levels in neon and argon has been studied by proton impact in the energy range of 100 keV to 1 150 keV. The results are compared with other experimental and theoretical data.

K. Koebke, M. F. El Eid, E. R. Hilf, Institut für Kernphysik, TH Darmstadt, Germany:
Non-Equilibrium Nuclear Abundances in Superdense Matter

1. The equation of state and nuclear composition are calculated for cold matter below neutron-drip density ($\sim 4 \times 10^{11}$ gr/cm^3) using recent nuclear data. – 2. Nuclear transmutations of hot and dense matter taking care of the freezing of nuclear reactions are discussed for three types of temperature and density changes.

W. Schmatz, P. H. Dederichs, and H. Scheuer, Institut für Festkörperforschung der Kernforschungsanlage Jülich, Germany:
Theory of Nuclear and Magnetic Neutron Small Angle Scattering at Dislocations in Anisotropic Cubic Crystals

An analytic expression for the dilatation and the stress tensor in reciprocal space due to dislocations in anisotropic cubic crystals is deduced. From this absolute values of nuclear and magnetic small angle scattering cross sections are calculated. For Cu and Ni they differ considerably from the values calculated with the assumption of elastic isotropy. The new presentation of scattering theory allows further the discussion of the interference in scattering between dislocations in a dislocation network.

D. A. Garber, M. Behar, Z. W. Grabowski, and Wm. C. King, Tandem Accelerator Laboratory, Purdue University, W. Lafayette, Indiana USA:
Nuclear g-Factors of the 328 keV State in ^{194}Pt, the 240 keV State in ^{195}Pt, and the 356 keV State in ^{196}Pt Determined by Recoil-Implantation into Iron and Cobalt Hosts

The ion-implantation-perturbed-angular correlation technique (IMPACT) has been used to measure the Larmor precessions of the 328 keV, 240 keV, and 356 keV states of ^{194}Pt, ^{195}Pt, and ^{196}Pt nuclei, respectively, in ferromagnetic iron and cobalt hosts. The observed angular precessions in iron, corrected for the transient field effect, were $\omega\tau_{194}(328) = 0.103 \pm 0.006$ rad, $\omega\tau_{195}(240) = 0.142 \pm 0.012$, and $\omega\tau_{196}(256) = 0.084 \pm 0.010$. For cobalt hosts, the observed Larmor precessions were $\omega\tau_{194}(328) = 0.068 \pm 0.006$, $\omega\tau_{195}(240) = 0.096 \pm 0.012$, and $\omega\tau_{196}(356) = 0.057 \pm 0.013$. Agreement between the g-factors obtained from the measurements in iron hosts and the measurements in cobalt hosts in very good, and a weighted average of the two measurements gives $g_{194}(328) = 0.349 \pm 0.031$, $g_{195}(240) = 0.136 \pm 0.013$, and $g_{196}(356) = 0.329 \pm 0.039$.

W. Glöckle, Institut für Theoretische Physik, Ruhr-Universität Bochum:
***R*-Matrix Approach to the 3-Body Problem**

The asymptotic form of the Faddeev amplitude in coordinate space is derived in various orders. This form and the structure of the Faddeev equations allow by a R-matrix method to establish a set of equations directly for the 3-body on-shell T-matrix elements. The procedure is equally well suited for local and nonlocal interactions.

E. Kuhlmann, A. Hoffmann and W. Albrecht, Fakultät für Physik der Universität Freiburg/Federal Republic of Germany:
High Spin States in ^{21}Ne

States in ^{21}Ne up to 6.3 MeV have been investigated by means of the ^{18}O($\alpha, n\gamma$)^{21}Ne reaction. The γ-decay of individual levels was studied in coincidence with neutrons by using a neutron time-of-flight spectrometer. Revised branching ratios are given for the states at 5.34, 5.63, 5.82 and 6.03 MeV. Neutron-gamma angular distribution measurements yielded the following J^π assignments: 5.34:7/2$^-$, 5/2$^+$; 5.63:(3/2, 7/2); 5.78:(3/2, 5/2); 6.03:9/2$^-$; 6.18: (5/2, 7/2); and 6.27:(7/2, 9/2). The results are discussed in the framework of the Nilsson model.

Instructions to Authors

Authors should prepare their manuscripts in strict accordance with these instructions.

Papers should preferably be written in English to ensure the widest possible circulation. In any case, all papers must have an **English abstract** and, if written in German, an **English translation of the title** as well.

The Zeitschrift für Physik cannot print very long papers in full, only a condensed version containing the essential results. Authors can, however, deposit the full version with Microfiche Publications, Div. of Microfiche Systems Corporation, 305 East 46 Street, New York, NY 10017 USA, or with the Zentralstelle für Atomenergie-Dokumentation (ZAED) at the Nuclear Research Center Karlsruhe, D-7500 Karlsruhe, Postfach 3640. The Editors will supply the author with fuller information once a shortened version has been accepted.

Manuscripts, to be submitted in duplicate, should include in the following order: title, author's name, address of author's institution; abstract; text of paper; acknowledgements; author's full address and academic affiliations; references. Figures, captions to figures, and tables should be attached to the manuscript but separate from it.

The manuscript should be typed double-spaced, on one side of letter-size white bond paper. Form and content should be carefully checked before submission to exclude the need for later corrections, as authors will receive only one set of proofs. For technical reasons, papers are made up into pages right away; it is therefore essential that manuscripts be submitted in their **final form.** The approximate positions of figures and tables must be marked in the margin.

Equations should be typewritten whenever possible, and special typefaces or alphabets have to be indicated by underlining in color (see below: Marking). Subscripts and superscripts must be recognizable as such. Formulas should preferably be written in "linear" form (see Notations). Equations should be numbered sequentially in arabic numerals placed in parentheses inside the right-hand margin. Footnotes should be indicated by an asterisk.

Figures should be restricted to the minimum needed to clarify the text. They should be numbered consecutively in arabic numerals and must be referred to in the text. Each figure should have a brief descriptive caption. Information given in captions should not be repeated in the text, nor should the same data be presented in both graph and table form. Previously published illustrations cannot usually be accepted.

Illustration copy should be original drawings in Indian ink, or photographic prints on which all symbols and letters are sharp and black. Lettering and points representing data should be clear with letters $\lesssim 1.5$ mm high, and line thickness >0.1 mm. Where **half-tone illustrations** are unavoidable, the photographs should be glossy prints in sharp focus and as rich in contrast as possible.

Literature references should be numbered in the order of citation (arabic numerals) and listed in numerical order at the end of the paper. References may be cited in the text simply by reference number in square brackets or by author's name (without initials) and reference number. If there are more than two authors, give name of the first author followed by *et al.* Multiple references should be cited as follows: [5, 6, 8]. References should be set out as shown in the following examples:

journal papers:

5. Andersen, N., Carriveau, G.W., Glinska, A.F., Jensen, K., Melskens, J., Veje, E.: Z. Physik **253**, 53 (1972)

books:

6. Flanagan, J.L.: Speech analysis, synthesis and perception, 2nd ed. pp. 89–97. Berlin-Heidelberg-New York: Springer 1972

Marking

Each manuscript should have a "Note to the printer" explaining markings, special types used, etc.

In **formulas** letters are normally printed in italics, and therefore need no underlining.

Special alphabets or typefaces should be indicated in accordance with the following code:
single underlining = small letter
double underlining = capital letter

yellow = Roman (i.e. the normal typeface used for the text) abbreviations like Re, Im, grad, div, lim, exp, sin, cos, tan, ctan, all units and chemical elements.

brown = Boldface: headings, letters in formulas, vectors
A, B, C, D, E, F, G, H, I, J, K, L, M, N, O, P, Q, R, S, T, U, V, W, X, Y, Z
a, b, c, d, e, f, g, h, i, j, k, l, m, n, o, p, q, r, s, t, u, v, w, x, y, z

red = Greek
$\Gamma, \Delta, \Theta, \Lambda, \Xi, \Pi, \Sigma, \Phi, \Psi, \Omega,$
$\alpha, \beta, \gamma, \delta, \varepsilon, \zeta, \eta, \vartheta, \iota, \kappa, \lambda, \mu, \nu, \xi, o, \pi, \rho, \sigma, \tau, \upsilon, \varphi, \phi, \chi, \psi, \omega$

green = Script:
$\mathcal{A}, \mathcal{B}, \mathcal{C}, \mathcal{D}, \mathcal{E}, \mathcal{F}, \mathcal{G}, \mathcal{H}, \mathcal{I}, \mathcal{J}, \mathcal{K}, \mathcal{L}, \mathcal{M}, \mathcal{N}, \mathcal{O}, \mathcal{P}, \mathcal{Q}, \mathcal{R}, \mathcal{S}, \mathcal{T}, \mathcal{U}, \mathcal{V}, \mathcal{W}, \mathcal{X}, \mathcal{Y}, \mathcal{Z}$
$a, b, c, d, e, f, g, h, i, j, k, l, m, n, o, p, q, r, s, t, u, v, w, x, y, z$

blue = Gothic:
$\mathfrak{A}, \mathfrak{B}, \mathfrak{C}, \mathfrak{D}, \mathfrak{E}, \mathfrak{F}, \mathfrak{G}, \mathfrak{H}, \mathfrak{I}, \mathfrak{J}, \mathfrak{K}, \mathfrak{L}, \mathfrak{M}, \mathfrak{N}, \mathfrak{O}, \mathfrak{P}, \mathfrak{Q}, \mathfrak{R}, \mathfrak{S}, \mathfrak{T}, \mathfrak{U}, \mathfrak{V}, \mathfrak{W}, \mathfrak{X}, \mathfrak{Y}, \mathfrak{Z}$
$\mathfrak{a}, \mathfrak{b}, \mathfrak{c}, \mathfrak{d}, \mathfrak{e}, \mathfrak{f}, \mathfrak{g}, \mathfrak{h}, \mathfrak{i}, \mathfrak{j}, \mathfrak{k}, \mathfrak{l}, \mathfrak{m}, \mathfrak{n}, \mathfrak{o}, \mathfrak{p}, \mathfrak{q}, \mathfrak{r}, \mathfrak{s}, \mathfrak{t}, \mathfrak{u}, \mathfrak{v}, \mathfrak{w}, \mathfrak{x}, \mathfrak{y}, \mathfrak{z}$

violet: the small letter *l* and the capital letter *O* (to distinguish them from the numeral 1 and zero)

It will help the printer if in doubtful cases the position of subscripts and superscripts is marked in the following way:
$b^{\wedge}_{i}, a^{i}_{\vee}$.

The following symbols are frequently confused:
$\cup, \mathbf{\cup}, \cup$; $o, O, 0$; $\mathrm{x}, x, X, \varkappa$; v, v, ν; $\phi, \varphi, \Phi, \varnothing$; $l, 1$; $\varepsilon, \in, \in$;
also the handwritten Roman letters:
c, C; k, K; o, O; p, P; s, S; u, U; v, V; w, W; x, X; z, Z; e, l;
the symbol a and the indefinite article a:
Please take care to distinguish them in some way.

Notations

preferred form	instead of
$\exp(-(x^2+y^2)/a^2)$	$e^{-\frac{x^2+y^2}{a^2}}$
$7/8, (a+b)/c$	$\frac{7}{8}, \frac{a+b}{c}$
$\frac{\cos(1/x)}{(a+b/x)^{1/2}}$	$\frac{\cos\frac{1}{x}}{\sqrt{a+\frac{b}{x}}}$
f^{-1}	$\overset{-1}{f}$

LB Landolt-Börnstein

Neue Serie/New Series

Gesamtherausgabe
Editor in Chief:
K.-H. Hellwege

Zahlenwerte und Funktionen aus Naturwissenschaften und Technik
Numerical Data and Functional Relationships in Science and Technology

Group I

Nuclear and Particle Physics

Volume 6

Properties and Production Spectra of Elementary Particles

By **A. N. Diddens, H. Pilkuhn, K. Schlüpmann**
Editor: **H. Schopper**
29 figures. XI, 164 pages. 1972
Cloth DM 118,–; US $ 48.40
ISBN 3-540-06047-2

Physical data on elementary particles are, of course, essential to the subject specialist. They are also useful to those engaged in research in astrophysics and cosmology. The tables in this volume present a critically selected body of data in a form which should enable the nonspecialist to find what he needs without difficulty. The long-term plan is to provide a systematic compilation of the most important data relating to elementary-particle physics with cross-references to detailed tables for special cases.

Volume 7

Elastic and Charge Exchange Scattering of Elementary Particles

By **P. J. Carlson, A. N. Diddens, G. Giacomelli, F. Mönnig, H. Schopper**
Editor: **H. Schopper**
81 figures. X, 540 pages. 1973
Cloth DM 340,–; US $ 139.40
ISBN 3-540-06248-3

This volume contains the data of elastic scattering processes of strongly interacting particles, including charge exchange scattering. Besides the differential cross sections, the total cross sections, polarization parameters and scattering amplitudes at 0° and 180° are compiled in tables. Some results are also presented as curves in order to show the trend of the data.

Volume 8

Photoproduction of Elementary Particles

By **H. Genzel, P. Joos, W. Pfeil**
Editor: **H. Schopper**
165 figures. VIII, 341 pages. 1973
Cloth DM 230,–; US $ 94.30
ISBN 3-540-06249-1

This volume contains critically analyzed data on Compton scattering and on photoproduction of pseudoscalar and vector mesons off nucleons and off deuterons. They are important not only for scientists doing experimental or theoretical work in the field of elementary particles but also for those with main interest in nuclear physics or astrophysics.

■ **Leaflets on request**

Prices are subject to change without notice.

Springer-Verlag
Berlin · Heidelberg · New York
München · Johannesburg · London · Madrid · New Delhi · Paris
Rio de Janeiro · Sydney · Tokyo · Utrecht · Wien

Zeitschrift für Physik

Band 269 · (Schluß-) Heft 4 · 1974

Table of Contents (continued)

A. Bartl, K. Wittmann: A Modified Born Term Model for $\pi^{\pm} \Delta$ Electroproduction 399

K. E. G. Löbner, J. A. Mirza: $E1$-$M2$-$E3$ Mixing of the 1241.7 keV Transition in ^{174}Yb 407

G. Wunner: Die Klassifikation nach inneren Symmetrien beim quantenmechanischen Mehrkörperproblem. II. n-Teilchensysteme mit harmonischer Wechselwirkung 411

Classification According to Internal Symmetries in the Quantum-Mechanical Many-Body-Problem. II. n-Particle-Systems with Harmonic Interaction

G. Schmidt, L. M. Simons: Investigation on the Parity Mixing of the 482 keV Transition in ^{181}Ta by Use of a Backscattering Polarimeter 421

Indexed in Current Contents

Forthcoming Papers at the End of the Issue
Neu eingegangene Arbeiten am Schluß des Heftes